

MILL'D LEAD,

DEMONSTRATED

To be a better and more durable Covering for Buildings, &c. and above 20 per Cent. cheaper than Cast-Lead can be; supposing that to be 16 s. and this but 13 s. a Hundred.

And also for Sheathing Ships against the Worm, better, and above Cent. per Cent. cheaper than the ordinaryest Wood-Sheathing can be.

TO prove the first, only two *Axioms*, or moral Truths (which will need no probation) are required to be granted, by which the Matters of Fact evident in the Case may be examined.

Axiom 1. That the heat of the *Sun* being allowed to be the common Cause of drawing, and consequently of cockling and cracking a *Lead-Covering*, the Beams thereof, which fall with *equal* force upon an *unequal* Body (such as a Sheet of *Cast-Lead* is) must draw the *thinner* and weaker parts more than the *thicker* and stronger.

Axiom 2. That if a *Plumber*, or at least-wise two of the *Chief Master-Plumbers* in *London*, joining together, shall (upon a *Wager* or *Trial* of Skill, wherein their Interest is highly concerned) undertake to cast *Sheets* of *Lead*, not *thinner* throughout the *whole Sheet*, than the *Size* required, and very little *thicker* in any place, they will cast as well, and as near *equality*, and the *Size* given as they can; and that the *Sheets* cast by them in such a *Trial*, or at least in two such *Trials*, ought to be taken for the greatest certainty, *Standard*, and *best Casting* any *Plumber* can pretend to; or at least-wise that such *Casting* is much better than what any *Customer* in the common course of their *Trade* can expect from them. This being granted.

From the first *Axiom* it follows, That if the *Plumber* could Cast exactly equal to the *thinner* parts of his *Sheet*, his *Cast-Lead* would make a better *Covering* than to be thicker in one place than in another; for that the *thicker* and *stronger* parts resisting the *Sun beams* more than the *thinner* and *weaker*, those parts must stay behind whilst the *weaker* move; which motion by degrees cockles and cracks the *Sheet*; whereas if the *Sheet* were exactly equal as the *Mill'd-Lead* is, it would by the *equal* force falling thereon, move or stay *equally* as the *Mill'd-Lead* does, where no other Cause or Accident occurs. Here note also, that this excess of *thickness* in some places, is not only unnecessarily paid for, but it helps forward the ruine of the rest.

Wherefore *Mill'd-Lead*, which is exactly equal, tho' no thicker than the *thinner* part of a *Cast-Sheet*, must be allowed to be a *better*, and more durable *Covering* than *Cast-Lead*. *Mill'd-Lead for Coverings Better.*

Obf. The *Mill'd-Lead Company* having in the Year 1678. made a Proposal to the then *Navy-Board*, to make their *Scuppers* of *Mill'd-Lead*, one *Mr. Parsons* a *Plumber* they had employ'd in that Work, opposed it; pretending, That altho' their *Cast-Lead* was not exactly equal, yet the inequality was so inconsiderable that the *Mill'd-Lead Scuppers* being proposed at 4 s. a hundred more than theirs, they would be much dearer to the King. The Board then asked him, What allowance of inequality he required? He answer'd, Not above half-a-Pound in Ten: Whereupon they ordered each to make 36 *Scuppers* of three several sizes and thickness, viz. of 8 pound, 10 pound, and 12 pound to the foot-square; with caution to the *Plumber*, That his *Lead* should not be thinner in the thinnest parts than their Demand, as little thicker any where as he could: Which he undertook; and both sides having sent in their *Scuppers*, the *Mill'd-Lead* which could easily be conformable to any thickness desired, weighed but 8 hundred, 1 quarter 26 pound; whereas the *Cast-Lead Scuppers* weighed 12 hundred 3 quarters 10 pound, about 1 part instead of $\frac{1}{2}$ more: This so much exceed-

exceeding his Undertaking, and he pretending carelesness of Servants, and other Excuses, the Board ordered a second Trial upon (double the Number) 72 Scuppers; when he took to his assistance one Mr. Whitehall, another Master-Plumber, who made part thereof; and it cannot be imagined but these Plumbers now used all their Skill and Care; notwithstanding which, the weight of their whole 72 was 25 hundred 1 quarter 12 pound; whereas the 72 Mill'd-Lead Scuppers weighed but 16 hundred 3 quarters 10 pound; about the same proportion with the former; which at 26 s. per hundred (the Cast-Lead Scuppers being then 22 s.) was above 27 per Cent. cheaper to the King. This appears more at large in a Memorial presented to the Navy-Board in May 1690. and Printed page 115. in a small Book lately published, treating (amongst other new Inventions and Improvements) of the Mill'd-Lead for Sheathing Ships, &c. and its Excellency in preference to Cast-Lead for all other purposes whatsoever, and the Plumbers suggestions, decrying the same, therein proved, to be idle, scandalous, and false, as well as the Shipwrights.

Divers other Trials of other kinds were afterwards made by direction of the present Navy-Board, with which they being farther satisfied, contracted for the Mill'd-Lead in general, for all Services of Their Majesties Tards; declaring in their Instructions to the Officers, That they had (amongst other Faults) found upon several Trials made, that the Cast-Lead was so unequal and uncertain, they could not have what they demanded, nor depend thereon for Their Majesty's Service, as they could do upon the Mill'd-Lead; and therefore ordered them to demand that only for the future, laying their old Plumbers, their Lead, and Solder totally aside.

From the Second Axiom, and only those two Trials above-mentioned, it plainly appears that the Plumbers (let them or their Friends pretend what they will) cannot Cast within $\frac{1}{2}$ equal to the Size given through the whole Sheet: Wherefore (it having been proved above, that Mill'd-Lead is for that reason at least $\frac{1}{2}$ better, and will in use go $\frac{1}{2}$ farther) whatsoever the Price of Mill'd-Lead be less than $\frac{1}{2}$ more than Cast-Lead, it must be granted that Mill'd-Lead is so much the cheaper.

Mill'd-Lead for Coverings Cheaper.

Now the Price of Mill'd-Lead, at the Rates above-supposed, being but about $\frac{1}{2}$ more, the same is above 20 per Cent. cheaper, as well as better than Cast-Lead, which was to be demonstrated.

For 3 C. of Cast-Lead at 13 s. is 39 s. and 2 C. of Mill'd-Lead at 16 s. is but 32 s. which being 7 s. less, it is almost 22 per Cent. cheaper.

32 — 7 :: 100 — 21 87 : Or, 21 l. 17 s. 6 d.

But if some are unwilling to grant that Mill'd-Lead is better, and will go farther than Cast-Lead, in so great a Degree as $\frac{1}{2}$, here's Latitude enough, let them allow half as much, and take $\frac{1}{4}$ or any Degree under $\frac{1}{2}$ (the Plumbers usual Price being 14 s. a hundred;) within which Limit, or Proportion of Inequality, sure they will be satisfied that Mill'd Lead is enough better and cheaper (besides the benefit of a more beautiful and lighter Covering) to recommend it to their Use, it being one considerable advantage also, that they are sure they shall have the Mill'd-Lead equal smooth and sound, and of what thickness they demand; whereas the Plumber can cast but by guess, and that liable to concealed Blow-holes, and Sand-holes, as the Plumbers call them, and where they happen, must also hasten the decay; which holes the Mill opens, and enlarges so, that it discovers all the defects of Casting, but hides none; tho' tis falsely pretended it closes those holes which the Sun opens again: and if the Plumber Casts so, as to bring the Charge less, or equal to the Price of the Mill'd-Lead, the Customer (if he carefully examines it) will find it to be so much thinner than the Mill'd-Lead in some places, as well as thicker in others, as to render that Covering at least 20 per Cent. worse; as is above demonstrated.

As to the Plumber's pretence, That their Covering being heavier, it will yield more Money again when both come to be stripp'd: It is not worth the answering, when it shall be considered, that Mr. Hale offers in his Advertisement (Published by it self, and Printed also in the Book above-mentioned, p. 93. to keep any Mill'd-Lead Covering, of 100 l. Value, that he lays but of 7 pound to the Foot in good repair, for 41 Tears (to name a Term certain and sufficient, tho' it must probably last much longer) for 5 s. a Tear: And that the different value of the Old Lead, after 41 Tears (if the Cast-Lead should be supposed to lye so long) to be paid in ready Money is not worth speaking

speaking of, if no regard were had to the damage a House may sustain by the leaking of a Cast-Lead Covering, and charge of patching it with Solder in the mean time.

Now as to the Mill'd-Lead Sheathing.

THE *Antelope*, a Merchant-man of about 600 Tun, Sheathed with *Mill'd-Lead*, having been employed in His Majesty's Service this last Summer, had her Sheathing viewed at her return into the Dock by Mr. *Shepherd*, and other Merchants her Owners, who declared themselves very well satisfied therewith; the same lying on very well, and firm, as at first doing, saving two or three small Places, where the Anchor-fluke had torn it: To prevent which, for the future, it has been thought fit to sheath over the Lead with Boards in the Wake of the Anchor and a-long about the Waters-edge, that Boats, or other Vessels coming on Board, or lying by her sides, may do the Lead-sheathing no damage, altho' the Shipwright has carried his Wood-sheathing lower than was necessary for that purpose (for Reasons best known to himself) contrary to the Owners Order. There was also a place rubb'd off about two hands breadth on one side of the Keele, supposed to be done by an Anchor-stock, she coming so often to an Anchor in this Service, that the sheathing could not be liable to suffer so much damage perhaps in a whole *East-India* Voyage, as the Commander hath certified. And for her * *Rudder-Irons*, which were new put on with her sheathing about 8 months before, some Shipwrights, and their Friends, would have perswaded them that they were eaten so very much that it was dangerous to send her to Sea again without shifting them, and that the Lead-Sheathing was the cause thereof; giving for Reasons, that the Water passing by the sides of the Ship, it was so tinged by the venomous quality of the Lead-Sheathing, that making a kind of eddy or or dead Water at the *Rudder*, it did there eat and corrode the Irons in this extraordinary manner they talk of; to which, Mr. *Hale* being present, was desired to give his Answer, but he told them, He thought it deserved none, till they had given a better Reason then he had done already (namely the great variety and difference in the composition and working the *Rudder-Irons*) for their unconstant and different duration, always known to have been before Lead-Sheathing was thought on, has been since, and ever will be upon all Ships sheathed either way, or not sheathed at all; and that their lasting has been as short and unconstant upon those others, as these sheathed with Lead, as he can prove if necessary, which effects ought to have been on all, as equal and constant as their causes are, if the sheathing either way were concerned therein: Whereupon the Shipwrights Reasons against the Lead-sheathing, and for shifting the *Rudder-Irons* (which if they could have obtained upon this Ship, how causeless soever, would have much countenanced their Clamour) appearing very weak and groundless, Mr. *Shepherd*, with his Partners, in the presence of divers other Merchants, declar'd, That if ever he sheathed another Ship it should be with *Mill'd-Lead*; (this being the third they had applied this sheathing to within this Twelve-month) and that this Ship (which was designed for a long Voyage) should go to Sea again with the same *Rudder-Irons* without any amendment. Since which (notwithstanding all the clamour and noise the Shipwrights make about this sheathing's rubbing off, and eating the *Rudder-Irons*) one Mr. *Haines* Merchant hath lately sheathed another Ship with it, called the *Fortune*, bound for *Guiney*. Thus much, with what is proved more at large in the * Book above-mentioned, may sufficiently satisfy the unprejudiced as to the *Rudder-Irons*; and the sheathing, being Metal which the Worm cannot enter, is a full Demonstration that this *Mill'd-Lead* is a better sheathing against the Worm (the first and only thing intended by sheathing) than the Wood sheathing can be.

Mill'd-Lead Sheathing Better.

The main reason of the different duration and very short lasting of some *Rudder-Irons* over others must be the slight working, and purging 'em from their more gross and earthy Parts with Fire and Hammer; for the Smith being paid by weight, will find temptation to work 'em as slight as he can, seeing that the more labour and charge he's at, the less money he shall receive for his Work.

action, who then contracted for the Lead-sheathing; and, after that, this clamour about the *Rudder-Irons* (never heard of before) was started when they found the other would not do.

* In that Book it appears that all Objections as to rubbing off by Cables lying on ground, &c. upon 5 years Experience and about half a score Ships sheathed, were removed to the Navy-Boards satisfaction.

Now as to its cheapness, suppose an ordinary Wood sheathing cost 10 d. a foot square, and that two such sheathings be allowed to last 7 years with Graving once or twice a year; and that for a Ship of about 600 Tun (which contains about 5400 foot of sheathing) but 40 l. a year be allowed for her Graving, this, in 7 years time, with the first charge of those two sheathings, would amount to 730 l.

Mill'd-Lead Sheathing above Cent. per Cent. Cheaper.

Suppos

Note. Nothing is required under or over this Sheathing, the Plank being brimmed and the Seams caulk'd, and some long Bristle-brushes on Board, to clean it once in two or three months, or as occasion offers, which yet fouls not so much as a Wood-sheathing does.

*N. The Lead Sh. is not
A. A. (not more than
the other at first
charge.*

Suppose also that a *Mill'd-Lead* sheathing would cost 15 d. a foot, and that one such sheathing be continued on but for the same term of 7 years, which (if the Ships Seams or Plank do not require its Stripping for other repairs) may last for any defect in the Sheathing it self twice as long, or longer, (as Experience has sufficiently shewn) with some small repairs for accidental rubs, which, with a little quantity of the Lead and Nails reserved on Board, any one may mend as opportunity offers. This 5400 Foot would cost the Owner, with allowance of $\frac{1}{4}$ only part for the old sheathing at stripping, but 253 l. 2 s. 6 d. which would be 476 l. 17 s. 6 d. saved in his Pocket out of his 730 l. that the Wood sheathing must have cost him in these 7 years time, if the Graving upon such a Ship had stood him in no more than 40 l. a year, as is above supposed. Nay, if one such Wood-sheathing would last the whole 7 Years, suppose but 45 l. a-year (which may be computed at much more) for the Graving, and the Lead sheathing will be still above Cent. per Cent. cheaper, which was to be demonstrated, there remaining 34 l. to spare, which may probably be more than the Lead-sheathing will require, to repair accidental rubs all the time.

Besides this, there are many other Advantages; for this Sheathing stiffens a Ship so, that she will bear more Sail, and is an undeniable security against the Worm, without any hindrance to Sailing, which the great thickness and roughness of a Wood Sheathing must obstruct.

And further, That Sheathing it self is more destructive to the Plank, it being well known, that when one Plank or Board is doubled, or clapp'd close, lying hot upon another, the undermost, in some time, will be coted, which in a Wood Sheathing must rot the Oakam also the sooner, whereas a Lead Sheathing preserves the Plank cool and sound, and the Oakam, perhaps, twice as long.

There is, besides the constant Employment of this Mill'd-Lead about Houses, a Church built in Well-Close, called the Danes Church, lately covered with it, notwithstanding the Plumbers are as industrious (it being their Interest also) to raise Stories, and make as great a noise against this Lead, and as senseless, as the Shipwrights do.

The Book above-mentioned may be had at the Booksellers following, viz. At Mr. Hensman's Shop in Westminster-Hall, Mr. Dring at the Harrow and Crown next Cliffords-Inn in Fleetstreet; The Harp in St. Paul's Church-yard; The Leg and Star over against the Royal Exchange; And the Mill'd-Lead it self of any thickness, from a Pound in a Foot, to 20 or more, for Lining of Casks or Boxes, Brewers Backs, Fishmongers, Distillers and Dairy Vessels, Cisterns, Gutters, Pipes, Crowning of Vaults to prevent Leaking, and for Covering of Signs to Paint on, as the Mill'd-Lead Sign is, and for Coffins, or any purpose whatsoever, where Sheet Lead may be used as well as Covering Houses, and many other things that Cast-Lead cannot be applied to. This Lead is of the usual breadth of 3 $\frac{1}{2}$ Foot, and may be had above twice as long as any Plumber pretends to Cast, if need require, to save drips, and comply with the length of Coverings. The present Rates being for 6 l. per Foot, and all thicker at 16 s. a hundred; and for each Pound in a Foot square thinner 12 d. a hundred more, at the Mill, or Water Carriage paid to any place upon the River about London, if the Quantity be considerable, but for small quantities under a Tun the Customer pays Boat Hire, or in lieu of Carriage 6 d. a hundred more at the Shop, and for odd Pounds under a Quarter 2 d. and 2 d. half penny the thinner sort, and Solder also at 6 d. a Pound, which the Plumbers by Combination have hitherto kept up at 9 d.

These Rates are not raised, altho' now at the reprinting of this Demonstration the Price of Pig-Lead is at least 30 s. a Fodder dearer than when these Rates were set.

At the Lead-Mill at Deptford, or at the Mill'd-Lead Sign in Aurange-Street by Red-Lion-Square, where Mr. Hale now lives, who can furnish the Customers with able Plumbers to work his Lead as there is occasion.

Merchants that transport Sheet-Lead abroad, will doubtless find a better Market for this than the other; and if they, or any else, having occasion for a quantity, shall think fit to send Piggs, or old Lead, into the Mill, they may, upon discourse with Mr. Hale, save something farther considerable herein also.

This Printed Sheet may be had at Mr. Hale's House, the Lead-Mill, or at any the Booksellers Shops above-named, Gratis.

L O N D O N: Printed November 20. 1695.